Fishery Data Series No. 02-23

Escapement, Terminal Harvest, and Fall Fry Tagging of Chilkat River Chinook Salmon in 2001

by

Randolph P. Ericksen

December 2002

Alaska Department of Fish and Game **Division of Sport Fish**

Symbols and Abbreviations

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Weights and measures (metric)

centimeter	cm
deciliter	dL
gram	g
hectare	ha
kilogram	kg
kilometer	km
liter	L
meter	m
metric ton	mt
milliliter	ml
millimeter	mm

Weights and measures (English)

cubic feet per second	ft^3/s
foot	ft
gallon	gal
inch	in
mile	mi
ounce	oz
pound	lb
quart	qt
yard	yd

Spell out acre and ton.

Time and temperature

day	d
degrees Celsius	°C
degrees Fahrenheit	°F
hour (spell out for 24-hour clock)	h
minute	min
second	s

Spell out year, month, and week.

Physics and chemistry

all atomic symbols	
alternating current	AC
ampere	A
calorie	cal
direct current	DC
hertz	Hz
horsepower	hp
hydrogen ion activity	pH
parts per million	ppm
parts per thousand	ppt, ‰
volts	V
watts	W

General

all commonly accepted abbreviations.	e.g., Mr., Mrs., a.m., p.m., etc.
all commonly accepted professional titles.	e.g., Dr., Ph.D., R.N., etc.
and	&
at	@
compass directions:	
east	E
north	N
south	S
west	W
copyright	©
corporate suffixes:	
Company	Co.
Corporation	Corp.
Incorporated	Inc.
Limited	Ltd.
et alii (and other people)	et al.
et cetera (and so forth)	etc.
exempli gratia (for example)	e.g.,
id est (that is)	i.e.,
latitude or longitude	lat. or long.
monetary symbols (U.S.)	$, ¢
months (tables and figures): first three letters	Jan,...,Dec
number (before a number)	# (e.g., #10)
pounds (after a number)	# (e.g., 10#)
registered trademark	®
trademark	™
United States (adjective)	U.S.
United States of America (noun)	USA
U.S. state and District of Columbia abbreviations	use two-letter abbreviations (e.g., AK, DC)

Mathematics, statistics, fisheries

alternate hypothesis	H_A
base of natural logarithm	E
catch per unit effort	CPUE
coefficient of variation	CV
common test statistics	F, t, χ^2, etc.
confidence interval	C.I.
correlation coefficient	R (multiple)
correlation coefficient	r (simple)
covariance	cov
degree (angular or temperature)	°
degrees of freedom	df
divided by	÷ or / (in equations)
equals	=
expected value	E
fork length	FL
greater than	>
greater than or equal to	≥
harvest per unit effort	HPUE
less than	<
less than or equal to	≤
logarithm (natural)	ln
logarithm (base 10)	log
logarithm (specify base)	$\log_2$, etc.
mideye-to-fork	MEF
minute (angular)	'
multiplied by	X
not significant	NS
null hypothesis	H_O
percent	%
probability	P
probability of a type I error (rejection of the null hypothesis when true)	α
probability of a type II error (acceptance of the null hypothesis when false)	β
second (angular)	"
standard deviation	SD
standard error	SE
standard length	SL
total length	TL
variance	var

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ABSTRACT

The harvest of chinook salmon *Oncorhynchus tshawytscha* in the Chilkat Inlet spring sport fishery and escapement into the Chilkat River are estimated annually to monitor this important sport fishery and the salmon stock that supports it. We used an age-stratified mark-recapture experiment to estimate spawning abundance of age-1.2 and older chinook salmon returning to the Chilkat River in 2001. Angler effort and harvest of wild mature chinook salmon in the Haines spring marine boat fishery were estimated using a creel survey. Harvest of large (≥28 inches total length) chinook salmon and chartered angler effort and harvest were also estimated.

We captured 295 medium and large (age-1.2 and older) chinook salmon with drift gillnets and fish wheels; 293 of these were tagged with solid-core spaghetti tags in the lower Chilkat River between June 7 and July 31, 2001. We examined 830 medium and large chinook salmon on spawning tributaries to the Chilkat River, and 47 of these were marked. On the basis of these data, we estimated that 5,272 (SE = 752) chinook salmon age-1.2 and older immigrated into the Chilkat River during 2001. An estimated 755 (SE = 209) were medium (age-1.2), and 4,517 (SE = 721) were large (age-1.3 and older) fish.

An estimated 5,299 angler-hours (SE = 815) of effort (5,107 targeted salmon hours, SE = 804) were expended for a harvest of 185 (SE = 26) chinook salmon (≥28 inches), of which 126 (SE = 20) were wild, mature fish. Chartered anglers accounted for 10% of the targeted salmon effort and 27% of the harvest of large chinook salmon.

Wild chinook salmon fry were trapped in three locations of the Chilkat River drainage during fall 2000 and fall 2001. We captured and released a total of 30,104 fry with coded wire tags in 2000, and a total of 23,123 fry in 2001. They averaged 70 mm (SE = 0.3) fork length in 2000 and 68 mm (SE = 0.3) in 2001. Future recoveries of these fish will allow us to estimate fall rearing abundance and marine harvest of these brood years.

Key words: Mark-recapture, creel survey, angler effort, harvest, marine boat sport fishery, escapement, coded wire tag, age composition, length-at-age, chinook salmon, *Oncorhynchus tshawytscha*, Chilkat River, Kelsall River, Tahini River, Big Boulder Creek, Haines, Southeast Alaska

INTRODUCTION

The Chilkat River drainage produces the third or fourth largest run of chinook salmon *Oncorhynchus tshawytscha* in Southeast Alaska (Pahlke 1997). This large glacial system has its headwaters in British Columbia, Canada, flows through rugged, dissected, mountainous terrain, and terminates in Chilkat Inlet near Haines, Alaska (Figure 1). The mainstem and major tributaries comprise approximately 350 km of river channel in a watershed covering about 1,600 km² (Bugliosi 1988). Chilkat River chinook salmon rear primarily in the inside waters of northern Southeast Alaska, and less so in the Gulf of Alaska, Prince William Sound, and Kachemak Bay (Pahlke 1991, Johnson et al. 1993, Ericksen 1996, 1999).

A spring marine boat sport fishery occurs annually in Chilkat Inlet (Figure 1) in Southeast Alaska near Haines and targets mature chinook salmon returning to the Chilkat River. A creel survey has been used to estimate harvest in this fishery since 1984. The harvest in this fishery peaked at over 1,600 chinook salmon in 1985 and 1986 (Neimark 1985; Mecum and Suchanek 1986, 1987; Bingham et al. 1988; Suchanek and Bingham 1989, 1990, 1991; Ericksen 1994, 1995, 1996, 1997, 1998, 1999, 2000, 2001a). The fishery in Haines contributes significantly to the local economy, supports a derby, and is popular both with local and non-local anglers (Bethers 1986, Jones and Stokes 1991).

Beginning in 1981, the Alaska Department of Fish and Game (ADF&G), Division of Sport Fish began a program to index chinook salmon abundance in the Chilkat River (Kissner 1982) using aerial survey counts in Stonehouse and Big Boulder creeks (Figure 1). These areas were selected because they were the only clearwater

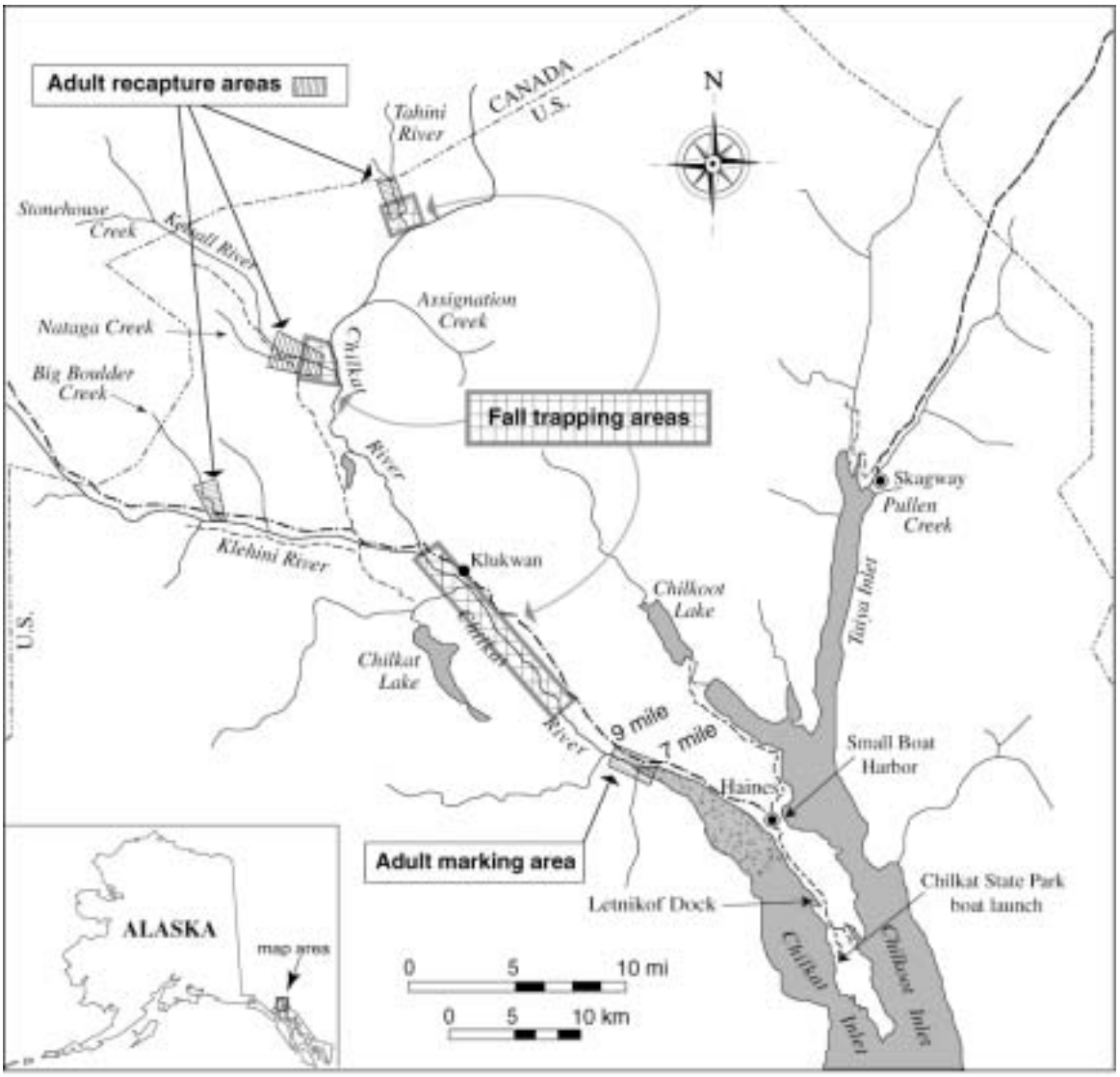


Figure 1.–Location of sampling sites in the Chilkat River drainage, near Haines in Southeast Alaska, 2001.

spawning areas that could be effectively surveyed. The indices were used in a regionwide program to monitor chinook salmon escapements in Southeast Alaska (Pahlke 1992).

Concern about Chilkat River chinook salmon developed when aerial survey counts declined in 1985 and 1986. This decline coincided with increasing marine harvests of chinook in the commercial troll, commercial drift gillnet, and sport fisheries in the area. In 1987, the Department began to restrict fisheries in upper Lynn Canal, and recreational fisheries were closed entirely in 1991 and 1992. The Haines King Salmon Derby was closed between 1988 and 1994.

Because of these concerns, the Division of Sport Fish conducted a coded wire tagging (CWTing) program on wild juvenile chinook salmon in 1989 and 1990 to identify migratory patterns and to estimate contributions to sport and commercial fisheries (Pahlke 1990, 1991). The Division of Sport Fish also conducted radiotelemetry and mark-recapture experiments in 1991 and 1992 to estimate spawning distribution and abundance of large (age-1.3 and older) chinook salmon in the river. Results of this research indicate that most

chinook spawn in two major tributaries of the Chilkat River, the Kelsall and Tahini rivers, and that immature fish are harvested primarily in the inside waters of Southeast Alaska (Johnson et al. 1992, 1993; Ericksen 1996, 1999). Escapements since 1991 have ranged between 2,035 (SE = 334) in 2000 and 8,100 (SE = 1,193) in 1997 (Johnson et al. 1992, 1993; Johnson 1994; Ericksen 1995–2001a).

The current Chilkat River escapement goal of 2,000 chinook salmon was established in the late 1970s and is currently under review. Regulations in effect during 2001 prevented sport fishing for chinook salmon near the mouth of the Chilkat River (Figure 1). Regionwide regulations allowed anglers to keep one king salmon 28 inches or greater in length per day and in possession. A nonresident angler annual limit of three king salmon 28 inches or greater in length was also in effect during 2001. In addition, effective June 13, the daily bag and possession limit for king salmon less than 28 inches in length was one for anglers fishing in Taiya Inlet. This regulation was implemented to allow anglers to harvest hatchery fish returning to the Skagway area. Commercial fishing regulations were structured to reduce incidental harvests of mature chinook salmon in the Lynn Canal gillnet fishery.

In 1999 we began to CWT chinook and coho salmon *O. kisutch* smolt during spring to enable us to estimate juvenile abundance, non-terminal harvest and total return (Ericksen 2001b, 2002, *In prep*). Although we were successful in capturing sufficient numbers of coho salmon smolt, the number of chinook salmon smolt tagged was poor. Thus, in 2000 we also began to trap juvenile chinook salmon (fry) during the fall.

The purpose of this study was to estimate the sport harvest and escapement of chinook salmon returning to the Chilkat River during 2001. In addition, we tagged juvenile chinook salmon so that we can estimate production and marine harvest of this stock in the future. This report describes the methods and results of the study during 2001 and for the fall tagging of juveniles since 2000. The long-term goal of this study is to develop maximum harvest guidelines for this stock in accordance with sustained yield management.

Research objectives in 2001 were:

1. to estimate the immigration of medium (age-1.2) and large (age-1.3 and older) chinook salmon into the Chilkat River in 2001;
2. to estimate the age, sex, and length compositions of the escapement of large chinook salmon in the Chilkat River in 2001; and,
3. to estimate the harvest of wild mature chinook salmon in the Haines spring marine boat sport fishery from May 7 to June 24, 2001.
4. to estimate the mean length of juvenile chinook salmon rearing in the Chilkat River drainage during fall 2000 and 2001.

METHODS

INRIVER ABUNDANCE

An age-stratified mark-recapture experiment was used to estimate the number of chinook salmon (age-1.2 and older) immigrating to the Chilkat River in 2001. Marks were applied to fish ≥440 mm mid-eye to fork of tail (MEF) captured in the lower Chilkat River with drift gillnets and fish wheels from June 7 through July 31, between the area adjacent to Haines Highway miles 7 and 9 (Figure 1). Chinook salmon were marked with a solid-core spaghetti tag and a hole punch in the upper left operculum prior to release. Water depth (cm), and temperature (°C) were recorded daily at 0700 and 1330 h near highway mile 8. Fish were examined for marks on three upriver spawning tributaries of the Chilkat River between August 2 and September 5.

Lower River Marking

Gillnets 21.3 m long and 3.0 m deep (70 ft × 10 ft) were drifted in the lower Chilkat River June 7 through July 24, 2001. The gillnets consisted of two equal-length panels: one of 17.1-cm (6.75" stretch measured) and the other of 20.3-cm (8.0" stretch measured) nylon mesh. We attempted to complete 43 drifts between 0600 and 1400 h each day. Fishing was conducted from an 18-ft boat in six adjoining 0.5-km sections, which were marked along a 3-km section of river (Figure 2). This

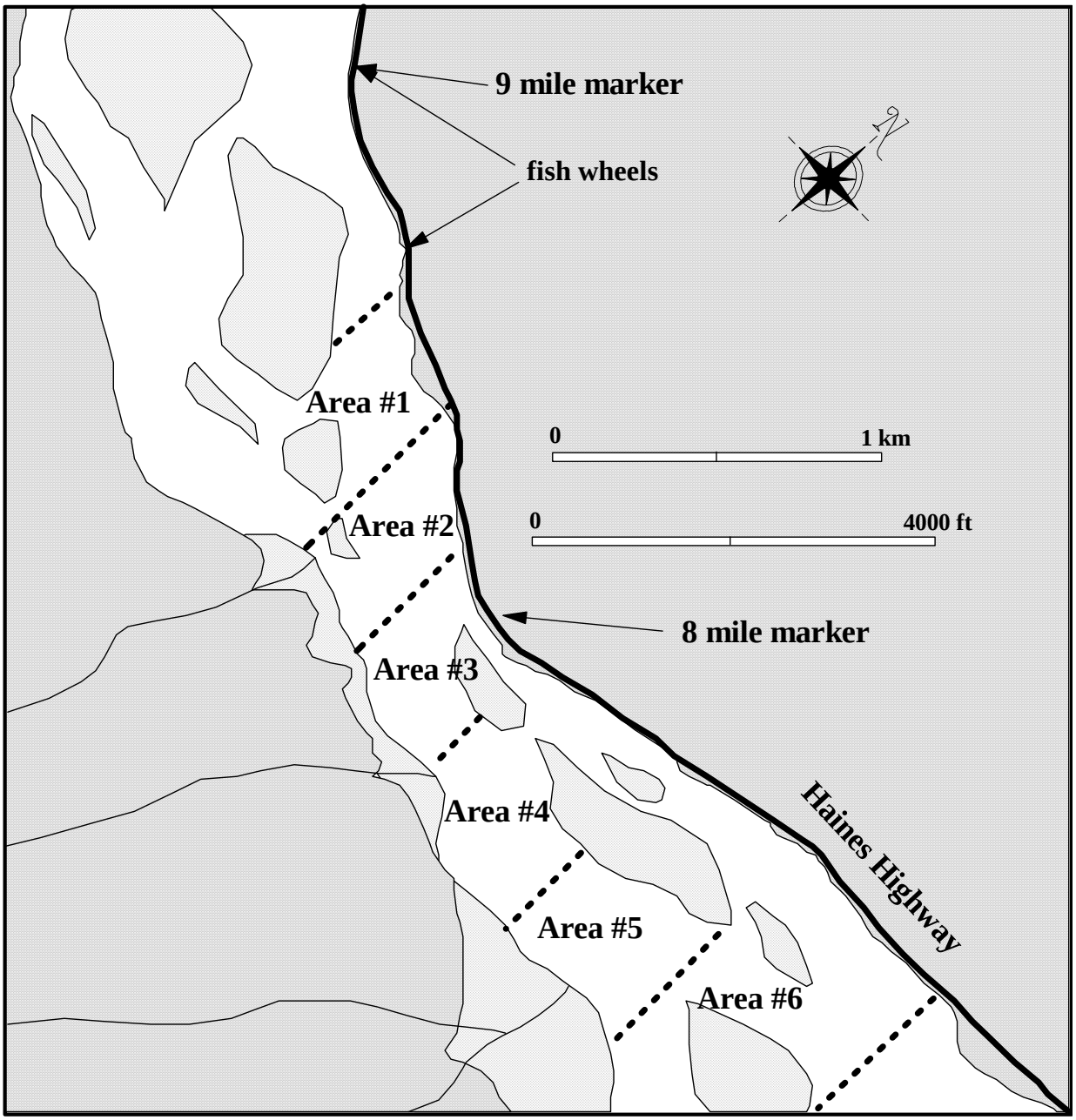


Figure 2.–Active lower Chilkat River channel, drift areas, and sites of fish wheels in 2001.

area was about 100 m wide and 2 to 3 m deep and located slightly downriver from the area used prior to 1998, because of shoaling. The 43 drifts took about 6 hours to complete when fish were not captured. Fishing continued uninterrupted from area to area if fish were not captured. If a (0.5-km) drift was prematurely terminated because a fish was caught, or if the net became entangled or drifted into shallow water, the terminated drift was subsequently completed before a new drift was started. If 43 drifts could not be completed during the day, additional drifts were added to the next day's total to make up the balance.

Two 3-basket aluminum fish wheels were installed on June 5 by ADF&G Commercial Fisheries Division (CFD) personnel and were

operated through October 7 to monitor the escapement of sockeye salmon *O. nerka* to the Chilkat River. One fish wheel operated adjacent to the Haines Highway near mile 9 and the other about 300 m downstream (Figure 2). The wheels were located along the east bank of the river where the main flow was constrained primarily to one side of the floodplain. Fish wheels were operated continuously except for maintenance.

Captured chinook salmon were placed in a water-filled tagging box (see Figure 3 *in* Johnson 1994), inspected for missing adipose fins, and measured to the nearest 5 mm, mid-eye-to-fork length (MEF). Fish were initially classified as "large," "medium," or "small," depending on their length: fish ≥660 mm MEF were designated as large, fish ≥440 and <660 mm MEF as medium, and fish <440 mm MEF as small. Healthy chinook salmon ≥440 mm MEF were scale sampled, visually "sexed," marked with a uniquely numbered spaghetti tag threaded over a solid plastic core and sewn through the bones near the base of the dorsal fin, and had a ¼-inch hole punched into the upper edge of the left operculum as a secondary mark. Technicians operating the gill net also marked fish by clipping (removing) the left axillary appendage. This helped to identify where the fish was marked (whether in the fish wheel or gillnet) in the event of tag loss. Small (<440 mm MEF) were sampled and marked as above except given a uniquely numbered t-bar anchor tag instead of a spaghetti tag. Age of each fish was determined postseason by scale pattern analysis (Olsen 1992). Each fish was then reclassified as large, medium, or small, using ocean age, rather than length, as criteria; fish with three or more ocean years of residence were classified as large, those with two ocean years as medium, and younger fish were classified as small. Any fish whose scales could not be aged was classified by length as described above.

Spawning Ground Recovery

Escapements in the Kelsall and Tahini rivers (Figure 1) were sampled for marks by two teams of two people. Spawning grounds in the Kelsall River (including Nataga Creek) were sampled from August 6 to September 5. Spawning grounds in the Tahini River were sampled from August 6 to September 3. Chinook salmon were also sampled in Big Boulder Creek from August 2 through August 30. Chinook salmon were captured with gillnets, dip nets, snagging gear, bare hands, and spears. Double sampling was prevented by punching a hole in the lower edge of the left operculum of all captured fish.

The validity of the mark-recapture experiment rests on several assumptions: (a) that every fish has an equal probability of being marked during event 1, or that every fish has an equal probability of being captured in event 2, or that marked fish mix completely with unmarked fish; (b) that recruitment and "death" (emigration) do not both occur between sampling events; (c) that marking does not affect catchability (or mortality) of the fish; (d) fish do not lose marks between sample events; (e) all recovered marks are reported; and (f) that double sampling does not occur (Seber 1982).

Stratifying the experiment into medium (age-1.2) and large (age-1.3 and older) fish ensures that abundance and age composition estimates for large fish are obtained by similar, robust methods each year (estimates for age-1.2 fish have not been possible in most years due to small sample sizes). In addition, key experimental assumptions that sampling is unselective by fish size, age, and sex are strained when age-1.2 fish are pooled with large fish, and meaningful failures can be difficult to detect with a small sample size. Selectivity assumptions for a stratum of age-1.2 fish are, in contrast, robust. These fish are mostly (>95%) male and span a small range of lengths relative to fish age-1.3 and older.

The validity of assumption (a) was tested through a series of hypothesis tests (all at $\alpha = 0.1$). First, a contingency table (chi-square statistic) was used to test the hypothesis that fish sampled at different spawning tributaries were marked at the same rate. Also, a contingency table was used to test the hypothesis that fish marked at different times in the emigration (e.g. early vs. late) were recaptured at the same rate.

The possibility of selective sampling was also investigated because assumption (a) could be violated if the sampling rate varied by size or sex of the fish. The hypothesis that fish of different sizes were captured with equal probability during

the second sampling event was tested with a Kolmogorov-Smirnov (K-S) 2-sample test comparing the size distribution of marked fish with those recaptured. If significant differences were observed between size compositions, the abundance estimate could be stratified by size, age, and/or by sex to reduce bias. The remaining assumptions are considered in the Discussion.

Abundance (numbers immigrating) of chinook salmon by age was estimated using the Chapman's modified stratified Petersen estimator for a closed population (Seber 1982):

$$\hat{N} = \frac{(n_1 + 1)(n_2 + 1)}{(m_2 + 1)} - 1 \qquad (1)$$

$$var[\hat{N}] = \frac{(n_1 + 1)(n_2 + 1)(n_1 - m_2)(n_2 - m_2)}{(m_2 + 1)^2 (m_2 + 2)} \qquad (2)$$

where n_1 is the number of chinook salmon marked by age class in the lower river, n_2 is the number examined by age class on the spawning grounds, and m_2 is the subset of n_2 which had been marked in the lower river.

Age and Sex Composition of the Escapement

Age and sex composition estimates can be biased due to sampling methods. Fish wheels can be selective for smaller fish (Ericksen 1995) and for males (Ericksen 1995–2001a) in some years. Carcass surveys are known to be sex selective in some situations (Pahlke et al. 1996, McPherson et al. 1997). In addition, significant variation in age and/or sex compositions between spawning areas can bias composition estimates for the entire drainage if sampling is not proportional to abundance. Bias was reduced in this experiment by stratifying the abundance estimate by age class.

All chinook salmon caught in the lower river and all live and dead chinook encountered on the spawning grounds were sampled, whenever possible, for age, length, and sex. Age compositions were tabulated separately for fish in the lower river gillnet, fish wheels, and in each escapement sampling location (tributary). Age composition, mean length-at-age, and variances of the catch in each gear type were calculated using standard normal statistics.

Size selectivity was investigated using two K-S tests: one described above, and the other comparing the lengths of fish marked in the lower river to those sampled on the spawning grounds.

Age and sex selectivity was investigated by contingency table analysis. The number of large chinook captured by age or sex in the lower river was compared with the number sampled on the spawning grounds. If sex compositions differed significantly, spawning ground samples alone were used to estimate sex composition, as sex determination is known to be more difficult early in the season while marking fish in the lower river (Ericksen 1995–2001a).

Sex composition of the escapement was obtained for each age class from pooled escapement samples. Proportions by sex for each age class were estimated by:

$$\hat{p}_{a,s} = \frac{n_{a,s}}{n_a} \qquad (3)$$

$$var[\hat{p}_{a,s}] = \frac{\hat{p}_{a,s}\ (1 - \hat{p}_{a,s})}{n_a - 1} \qquad (4)$$

where $p_{a,s}$ is the proportion of age class a fish of sex s, $n_{a,s}$ is the number of age class a fish in the sample of sex s, and n_a is the number of age a fish in the sample.

The abundance of age a chinook salmon by sex in the escapement was estimated as:

$$\hat{N}_{a,s} = \hat{N}_a\ \hat{p}_{a,s} \qquad (5)$$

$$\begin{aligned} &\text{var}[\hat{N}_{a,s}] = \\ &\text{var}[\hat{p}_{a,s}]\hat{N}_a^{\,2} + \text{var}[\hat{N}_a]\hat{p}_{a,s}^{\,2} - \text{var}[\hat{p}_{a,s}]\text{var}[\hat{N}_a] \end{aligned} \qquad (6)$$

where $\hat{N}_a$ is the estimated abundance of age a chinook salmon.

HARVEST

2001 Haines Marine Sport Fishery Harvest

A stratified two-stage direct expansion creel survey was used to estimate the harvest of chinook salmon in the Haines marine boat sport fishery. Temporal stratification included 7-day (weekly) periods at one high-use site and 14-day (biweekly) periods at two low-use sites. However, a separate temporal stratum existed during the two weekends of the Haines Derby (May 26, 27, 28, and June 2 and 3) at both high- and low-use sites. Each fishing day was defined as starting at 0800 hours and ending at civil twilight, which ranged from 2215 to 2352 hours.

The three access locations were the Letnikof Dock (the high-use site), the Chilkat State Park boat launch, and the Small Boat harbor (Figure 1). Prior surveys indicate that anglers landing their catch at the Letnikof Dock account for 62–93% of the harvest of chinook salmon. Sampling at each location had days as primary sampling units and boat-parties as secondary units.

Sampling at Letnikof Dock occurred from May 7 to June 24, 2001, and contained morning/evening stratification and weekend/weekday stratification of evening strata during the peak of the season. Morning sampling strata lasted from 0800 hours until two hours before midday, and evening sampling strata lasted from two hours before midday until civil twilight. Thus, evening strata were four hours longer in duration than morning strata. This stratification scheme was designed to increase the precision of estimates by maximizing sampling during hours when most anglers exit the fishery. Random selections determined primary units to sample in each stratum. Two morning and three evening strata were sampled each week, except as noted below.

During the peak of the fishery (May 7 through June 10) the evening strata at Letnikof Dock were further divided into weekday and weekend stratification. During this time, two mornings, two-weekday evening, and two weekend/holiday evening periods were sampled each week. In total, 17 unique strata were sampled at Letnikof Dock in 2001.

Sampling at the Small Boat Harbor and Chilkat State Park boat launch was initiated on May 7 and May 14, respectively, and continued through June 24. There was no type of day stratification at the low-use sites, so each sampling biweekly period was divided into 14 morning and 14 evening periods of equal length, except for the first and last 7-day sampling periods at the Chilkat State Park boat launch, and the last 7-day period at the Small Boat Harbor. Random selections determined primary units to sample in each morning and evening stratum. To accommodate the impossibility of sampling three sites simultaneously with only two technicians, 21 changes (period moves) were made to the randomized sampling schedule at low-use sites. Eighteen (18) unique strata were sampled at the low-use harbors during 2001.

During each sample period, all sport fishing boats returning to the harbor were counted. Boat-parties returning to the dock were interviewed to determine: the number of rods fished; hours fished; type of trip (charter or non-charter); target species (chinook salmon, Pacific halibut *Hippoglossus stenolepis*); and number of fish kept and/or released by species. Interviewing boat-parties also included sampling all harvests of chinook salmon for maturity and missing adipose fins. Maturity was also determined (Ericksen 1994, Appendix A) in order to estimate the harvest of wild mature fish assumed to be returning to the Chilkat River. In rare cases, some parties were not interviewed, or maturity status could not be determined. When one or more boat-parties could not be interviewed, total effort and catch for the stratum was estimated by expanding by the total number of parties returning to the dock during that period. Similarly, when a boat-party had fish of undetermined maturity status, interview information for that boat-party was ignored and expansions (by sample period) were made from harvests by remaining boat-parties and the total number of boat-parties counted.

The harvest in each stratum ($\hat{H}_h$) was estimated (Cochran 1977):

$$\hat{H}_h = D_h \overline{H}_h \qquad (7)$$

$$\overline{H}_h = \frac{\sum_{i=1}^{d_h} \hat{H}_{hi}}{d_h} \quad (8)$$

$$\hat{H}_{hi} = M_{hi} \frac{\sum_{j=1}^{m_{hi}} h_{hij}}{m_{hi}} \quad (9)$$

where h_{hij} was the harvest on boat j in sampling days (periods) i stratum h; m_{hi} was the number of boat parties interviewed in day i; M_{hi} was the number of boat-parties counted in day i; d_h was the number of days (morning or evening periods) sampled in stratum h; and, D_h was the number of days in stratum h. The variance of the harvest by stratum was estimated:

$$var\left[\hat{H}_h\right] = (1 - f_{1h}) D_h^{\,2} \frac{\sum_{i=1}^{d_h} (\hat{H}_{hi} - \overline{H}_h)^2}{d_h (d_h - 1)} + D_h \sum_{i=1}^{d_h} M_{hi}^{\,2} (1 - f_{2hi}) \frac{\sum_{j=1}^{m_{hi}} (h_{hij} - \overline{h}_{hi})^2}{d_h m_{hi} (m_{hi} - 1)} \quad (10)$$

where f_{1h} was the sampling fraction for periods and f_{2hi} was the sampling fraction for boat-parties. Catch and effort was estimated similarly, substituting C and E for H in equation 7 through equation 10. Total harvests for the season were the sums across strata ΣH_h and $\Sigma var[H_h]$. Similarly, the effort and harvest by charter boat anglers were estimated by considering only data collected from chartered anglers in equation 7 through 10.

Chinook salmon sampled in the angler harvest were measured to the nearest 5-mm in fork length. Five scales were removed from the left side of each sampled fish (right side if left side scales were regenerated), along a line two scale rows above the lateral line between the posterior insertion of the dorsal fin and anterior insertion of the anal fin. A triacetate impression of the scales (30 s at 3,500 lb/in² at a temperature of 97°C) was used for age determination. Scales were aged using scale pattern analysis (Olsen 1992). Information recorded for each chinook salmon sampled included sex, length, maturity, and presence or absence of adipose fins.

Age composition and mean length-at-age of chinook salmon in the sport fishery harvest, and associated variances were estimated using standard normal statistics. This calculation for a stratified sampling program is warranted when there is no trend in the age composition or sampling is proportional over time. Because sampling was not proportional in all strata, a chi-square statistic was used to test whether there was a change in the age composition over time.

Contribution of Coded Wire Tagged Stocks

Technicians retained heads from chinook salmon in the marine sport fishery with missing adipose fins, and a plastic strap with a unique number was inserted through the jaw of the head. Heads and CWT recovery data were sent to the ADF&G CWT Processing Laboratory in Juneau, where any tags present were removed, decoded, and corresponding information entered into the tag lab database.

The contribution of all tagged stocks to the 2001 Haines marine boat sport fishery were estimated:

$$\hat{r}_{ij} = \hat{H}_i \left(\frac{m_{ij}}{\lambda_i n_i} \right) \hat{\theta}_j^{\,-1} \quad (11)$$

where $\hat{H}_i$ is the estimated harvest in stratum i, $\hat{\theta}_j$ is the fraction of stock j marked with CWTs, n_i is the subset of $\hat{H}_i$ examined for missing adipose fins, m_{ij} is the number of decoded CWTs recovered from stock j, and $\lambda_i = (a_i' t_i')/(a_i t_i)$ is the decoding rate for CWTs from recovered salmon. See Bernard and Clark (1996) for further details. Statistics were stratified by bi-week.

Variance of $\hat{r}_{ij}$ was estimated using the appropriate large-sample formulations in Bernard and Clark (1996, their Table 2) for wild or hatchery stocks harvested in the recreational fishery. The total contribution of one or more cohorts to one or more fisheries is the sum of harvests and variances from the individual cohorts and strata.

FRY CAPTURE, CODED WIRE TAGGING, AND SAMPLING

Juvenile chinook salmon (fry) were captured in primary rearing areas of the Chilkat River drainage during the fall and marked with an adipose fin clip and a CWT in 2000 (brood year 1999) and 2001 (brood year 2000). Adult fish will be sampled from the escapement between 2002 and 2008 to estimate the marked fraction for each brood year. This information will allow us to estimate the fall rearing abundance in 2000 and 2001. In addition, random recoveries of CWTs in sampled marine fisheries will allow us to estimate total marine harvest of this stock.

Chinook salmon fry were captured at three locations in the Chilkat River drainage using G-40 minnow traps during the fall of 2000 and 2001. Trapping began in upriver locations and moved downstream as the season progressed. The Tahini River was trapped from mid to late September, the Kelsall River was trapped during the first three weeks of October, and the lower Chilkat River near highway mile 19 (the Council Grounds) during the last week of October.

A crew consisting of four people fished approximately 80-100 traps per day. Traps were baited with disinfected salmon roe and checked at least once per day. Crew members immediately released non-target species at the trapping site. Remaining fish were transported to holding boxes for processing at a central tagging location.

All healthy chinook ≥50 mm fork length (FL) were marked with an adipose finclip and a CWT. Fish were first tranquilized in a solution of Tricaine methanesulfonate (MS 222) buffered with sodium bicarbonate. Fish were tagged with a CWT and marked by excision of the adipose fin, following the methods in Koerner (1977). Every 50th fish tagged was measured to the nearest mm FL.

All marked fish were held overnight to check for 24-hour tag retention and handling induced mortality. The following morning 100 fish in the previous day's catch were randomly selected and checked for the retention of CWTs and mortality. If tag retention was 98/100 or greater, mortalities were counted and all live fish from that batch were released. If tag retention was less than 98/100, the entire batch was checked for tag retention and those that tested negative were re-tagged. The number of fish tagged, number of tagging-related mortalities, and number of fish that had shed their tags were compiled and submitted to the CFD Tag Lab in Juneau at the completion of the field season.

In addition, Chilkat River chinook salmon smolt incidentally caught during the spring as part of a coho salmon project were CWT'd to increase the number of fish tagged. The methods and tagging results from the spring are reported in Ericksen 2002 and *In prep*.

RESULTS

INRIVER ABUNDANCE

We captured 246 large, 49 medium, and 67 small chinook salmon in the lower Chilkat River with drift gillnets and fish wheels between June 7 and July 31, 2001 (Table 1, Figure 3). Of those captured, 244 large, 49 medium, and 64 small chinook salmon were given an external tag. Two large fish captured in the fish wheels had died (one killed by otter). Three small fish were missing adipose fins and were sacrificed to recover coded wire tags. All three were CWT'd as smolt in the Chilkat River during the spring of 2000. Capture rates of large chinook salmon peaked on July 6. The mean date of migratory timing (weighted mean, Mundy 1984) in the lower river was July 3 (Figure 4).

Fish captured in gillnets were predominantly age-1.3 (58.1%) and classified as female (60.0%, Table 2). Those captured in the fish wheels were classified mostly as males (62.3%) and most commonly age-1.1 (41.1%, Table 2). Most (121) of the fish in the drift gillnet were captured in the large mesh (8-in.) panel. However, most (17) medium fish in the drift gillnet were caught in the small mesh (6.75-in.) panel. Large chinook salmon captured in gillnets and fish wheels were not significantly different in size (K-S test, $d_{max} = 0.143$, $P = 0.247$) or age composition ($\chi^2 = 0.243$, $df = 1$, $P = 0.622$).

We examined 695 large, 135 medium, and 19 small chinook salmon on the spawning grounds for marks: 39 large, 8 medium, and 2 small marked

Table 1.–Numbers of chinook salmon caught in the lower Chilkat River by time period, gear type and size, June 7– July 31, 2001.

Time period	Drift gillnet			Fish wheels			Combined			
	Large	Medium	Small	Large	Medium	Small	Large	Medium	Small	Total
6/07–6/11	1	0	0	0	0	0	1	0	0	1
6/12–6/16	1	0	0	0	0	1	1	0	1	2
6/17–6/21	11	1	0	2	1	0	13	2	0	15
6/22–6/26	30	3	0	11	9	11	41	12	11	64
6/27–7/01	29	4	0	10	8	15	39	12	15	66
7/02–7/06	38	4	0	12	4	16	50	8	16	74
7/07–7/11	30	2	0	9	2	20	39	4	20	63
7/12–7/16	15	3	0	13	1	1	28	4	1	33
7/17–7/21	13	4	0	12	1	2	25	5	2	32
7/22–7/26	6	0	0	2	2	1	8	2	1	11
7/27–7/31				1	0	0	1	0	0	1
	174	21	0	72	28	67	246	49	67	362

fish were recovered (Table 3). Three large (two marked at the fishwheel and one at the gillnet) were recovered with missing tags but were identified as marked fish by the opercular punch.

Similar fractions of large ($\chi^2 = 0.823$, df = 2, P = 0.663) and medium ($\chi^2 = 0.766$, df = 2, P = 0.682) chinook salmon sampled at each spawning tributary were marked. Thus, Petersen models were used to estimate abundance for each size group.

The cumulative distribution function (CDF) of lengths of large chinook salmon marked in the lower Chilkat River was not significantly different from the CDF of those tagged chinook salmon recaptured on the spawning grounds (K-S test, $d_{max} = 0.098$, P = 0.276), although the distributions visually appear different (Figure 5, top). The CDF of lengths of large fish sampled in the lower river was significantly different from the CDF of those examined for marks on the spawning grounds (K-S test, $d_{max} = 0.098$, P = 0.062, Figure 5, bottom). These results suggest that the first sampling event was size selective but the second was not. However, the power of the first test was low due to the low number of marked fish that were recaptured. Therefore, the estimate was stratified by age to reduce bias. Thus, we estimate that 5,272 (SE = 752) chinook salmon age-1.2 and older immigrated into the Chilkat River in 2001. Of those, 755 (SE = 209) were age-1.2; 2,529 (SE = 376) were age-1.3; and 1,988 (SE = 617) were age-1.4. These estimates are germane to the time of tagging in the lower river since an unquantified removal occurs (from natural mortality and subsistence fishery harvest) between the two sampling events.

Age and Sex Composition of the Escapement

We sampled 835 chinook salmon on the spawning grounds for age and sex. Of those sampled, 731 were successfully aged (Table 4). Similar to earlier results indicating size-selective sampling, age composition of large fish was significantly different between marking and recovery events ($\chi^2 = 14.3$, df = 1, P < 0.001; 1.3's were more common in the spawning ground samples). Also, age compositions of large fish were significantly different between the spawning tributaries ($\chi^2 = 64.2$, df = 2, P < 0.001).

Sex composition of large chinook salmon was significantly different between marking and

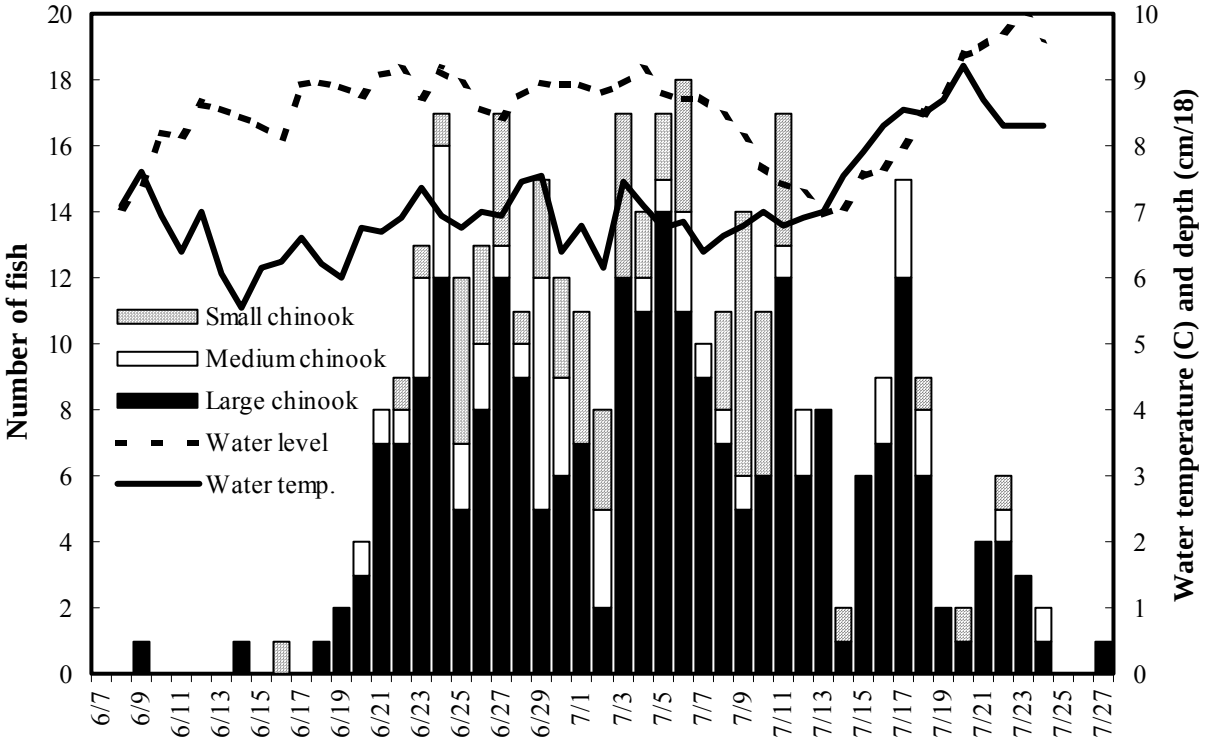


Figure 3.–Daily water depth (cm/18), temperature (°C), and catches of small (age 1.1), medium (age 1.2), and large (≥1.3) chinook salmon in drift gillnets and fish wheels operating in the lower Chilkat River, June 7–July 27, 2001.

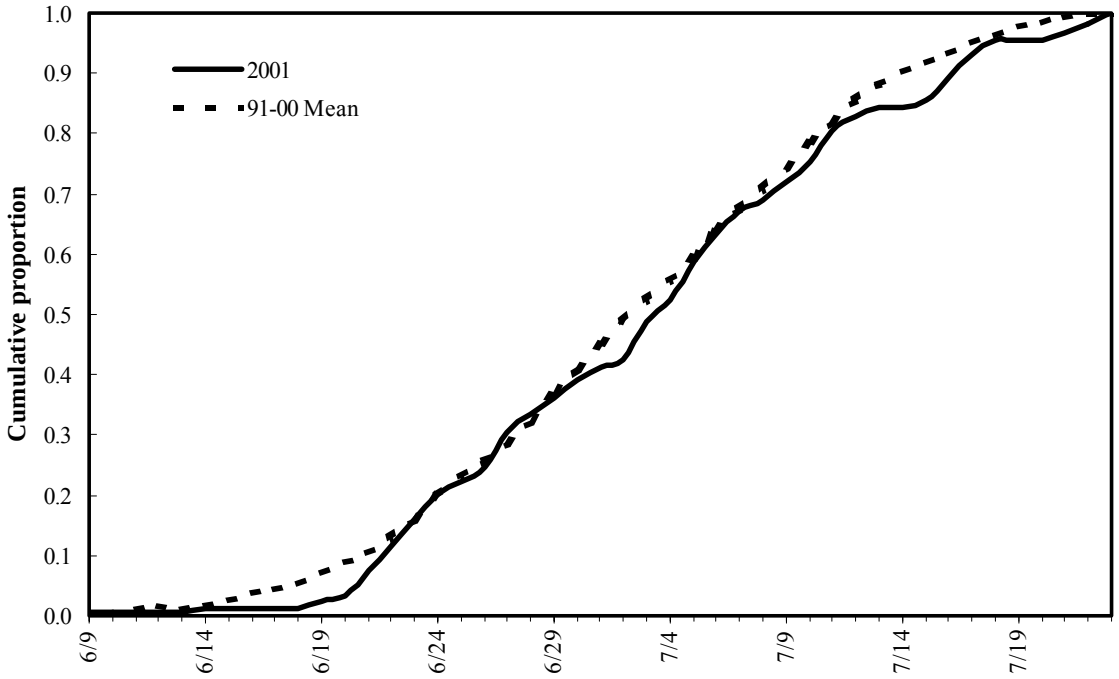


Figure 4.–Cumulative proportion of large (≥1.3) chinook salmon captured with drift gillnets in the lower Chilkat River in 2001 compared to the mean cumulative proportion, 1991–2000.

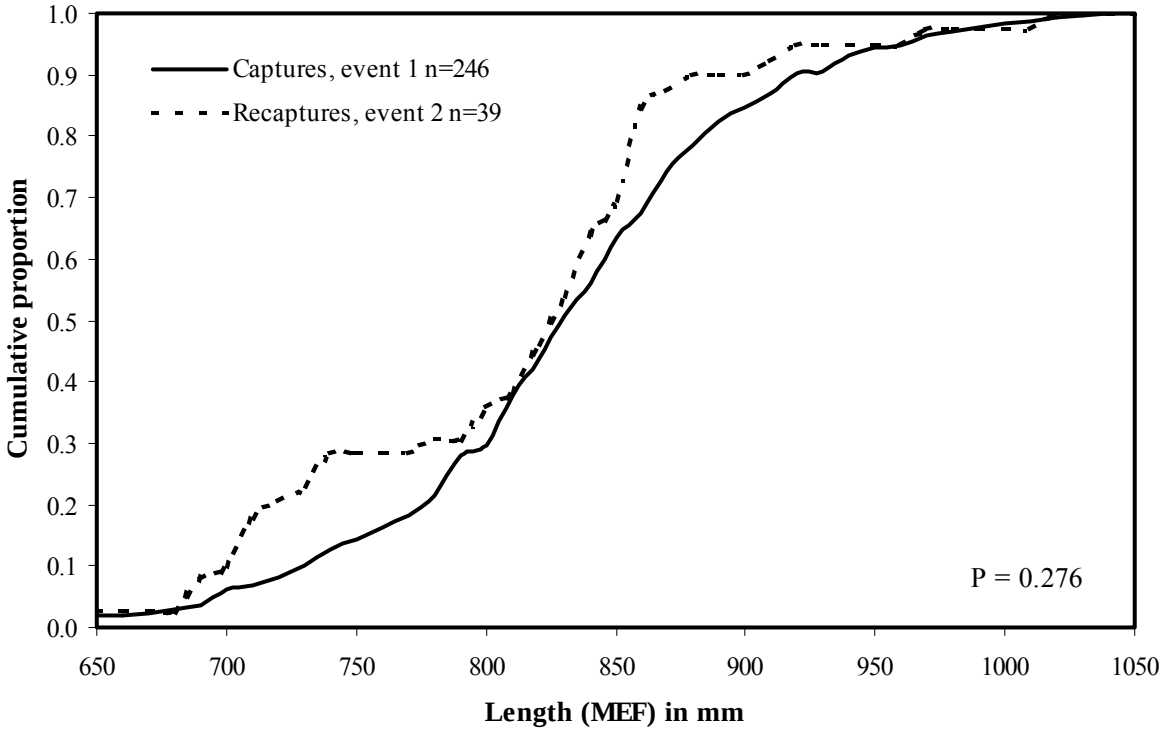
Table 2.–Age composition and mean length-at-age (measured in mm from mid-eye to fork of tail) of chinook salmon sampled during tagging operations on the Chilkat River, by gear type, 2001.

		Brood year and age class				Total aged	Total sampled[a]
		1998 1.1	1997 1.2	1996 1.3	1995 1.4		
DRIFT GILLNET							
Males	Sample size	0	16	43	11	70	78
	Percent		22.9	61.4	15.7		40.0
	SD		5.0	5.8	4.3		3.5
	Mean length		605	800	950		
	SD		19.6	12.4	13.5		
Females	Sample size	0	4	57	41	102	117
	Percent		3.9	55.9	40.2		60.0
	SD		1.9	4.9	4.9		3.5
	Mean length		648	817	881		
	SD		15.1	6.3	9.2		
All fish	Sample size	0	20	100	52	172	195
	Percent		11.6	58.1	30.2		
	SD		2.4	3.8	3.5		
	Mean length		613	809	895		
	SD		16.3	6.5	8.7		
FISH WHEELS							
Males	Sample size	62	12	17	6	97	104
	Percent	63.9	12.4	17.5	6.2		62.3
	SD	4.9	3.3	3.9	2.4		3.8
	Mean length	372	576	785	891		
	SD	4.7	19.9	20.2			
Females	Sample size	0	12	28	14	54	63
	Percent		22.2	51.9	25.9		37.7
	SD		5.7	6.8	6.0		3.8
	Mean length		607	793	860		
	SD			11.8	19.0		
All fish	Sample size	62	24	45	20	151	167
	Percent	41.1	15.9	29.8	13.2		
	SD	4.0	3.0	3.7	2.8		
	Mean length	372	591	790	869		
	SD	4.7	11.4	10.5	16.8		

[a] Includes fish that were not assigned an age.

Table 3.–Number of chinook salmon inspected for marks and number of marked fish recaptured during tag recovery surveys in the Chilkat River drainage, by location, size and sex, 2001. (M = male; F = female; U = not sexed.)

		Inspected										Marked					
		Large				Medium			Small			Large			Medium		Small
	Dates	M	F	U	Total	M	F	Total	M	F	Total	M	F	Total	M	Total	Total
Kelsall	8/06–9/05	213	148	5	366	9	0	9	7	0	7	15	8	23	1	1	1
Tahini	8/06–9/03	136	68	6	210	97	0	97	10	0	10	7	4	11	6	6	1
Big Boulder	8/02–8/30	52	64	3	119	29	0	29	2	0	2	2	3	5	1	1	0
Total		401	280	14	695	135	0	135	19	0	19	24	15	39	8	8	2



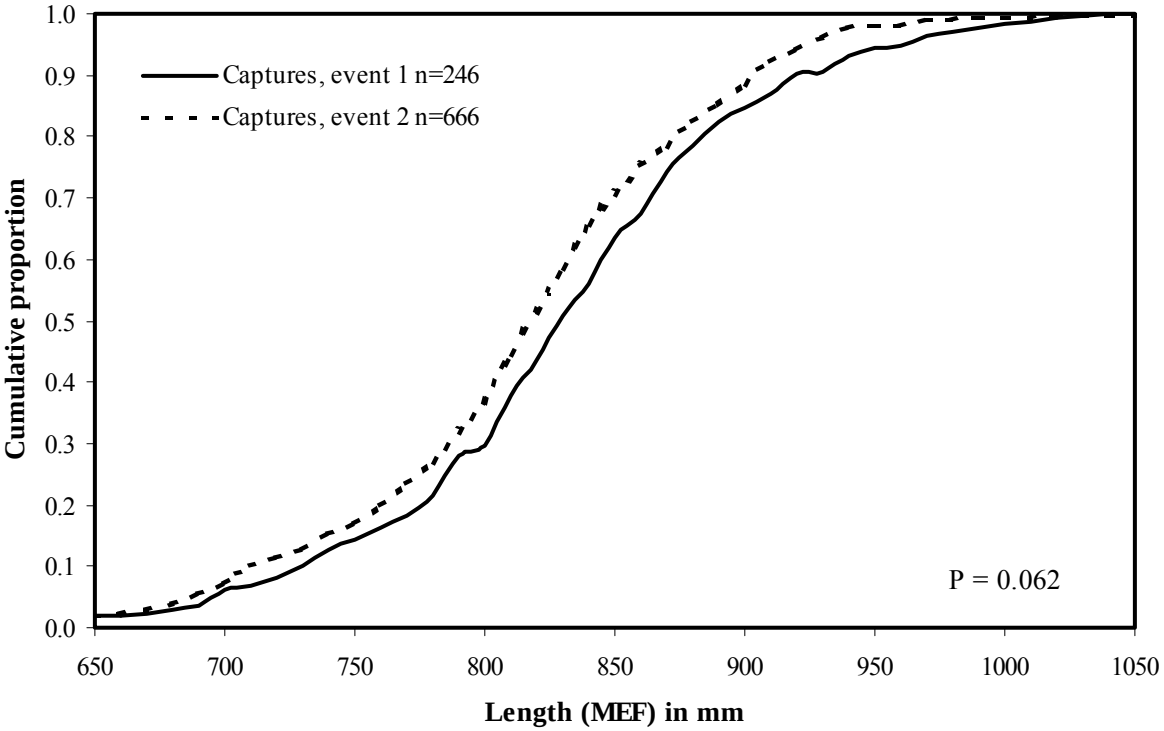


Figure 5.–Cumulative distribution function (CDF) of MEF lengths of large (≥1.3) chinook salmon marked in the lower Chilkat River versus lengths of marked fish recaptured on the spawning grounds (top) and versus lengths of large fish examined for marks on the spawning grounds (bottom), 2001.

Table 4.–Age composition and mean length-at-age (measured in mm from mid-eye to fork of tail) of chinook salmon sampled during recovery surveys on the Chilkat River drainage, by spawning tributary, 2001.

		Brood year and age class						
		1998	1997	1996	1995	1994	Total	Total
		1.1	1.2	1.3	1.4	1.5	aged	sampled[a]
TAHINI RIVER								
Males	Sample size	8	90	114	9	0	221	243
	Percent	3.6	40.7	51.6	4.1			78.1
	SD	1.3	3.3	3.4	1.3			2.3
	Mean length	373	607	779	908			
	SD	9.3	6.3	7.5	11.4			
Females	Sample size	0	0	47	12	0	59	68
	Percent			79.7	20.3			21.9
	SD			5.2	5.2			2.3
	Mean length			820	880			
	SD			5.6	8.6			
All fish	Sample size	8	90	161	21	0	280	311
	Percent	2.9	32.1	57.5	7.5			
	SD	1.0	2.8	3.0	1.6			
	Mean length	373	607	791	892			
	SD	9.3	6.3	5.7	7.4			
BIG BOULDER CREEK								
Males	Sample size	1	27	30	17	1	76	83
	Percent	1.3	35.5	39.5	22.4	1.3		56.5
	SD	1.3	5.5	5.6	4.8	1.3		4.1
	Mean length	400	594	762	848	915		
	SD		11.8	11.1	18.2			
Females	Sample size	0	0	16	38	0	54	64
	Percent			29.6	70.4			43.5
	SD			6.2	6.2			4.1
	Mean length			780	856			
	SD			8.8	7.6			
All fish	Sample size	1	27	46	55	1	130	147
	Percent	0.8	20.8	35.4	42.3			
	SD	0.8	3.6	4.2	4.3			
	Mean length	400	594	768	854			
	SD		11.8	7.9	7.6			
KELSALL RIVER/NATAGA CREEK								
Males	Sample size	6	7	142	40	0	195	229
	Percent	3.1	3.6	72.8	20.5			60.7
	SD	1.2	1.3	3.2	2.9			2.5
	Mean length	373	601	801	911			
	SD	17.3	23.2	5.9	10.4			
Females	Sample size	0	0	89	37	0	126	148
	Percent			70.6	29.4			39.3
	SD			4.1	4.1			2.5
	Mean length			807	858			
	SD			4.3	8.3			
All fish	Sample size	6	7	231	77	0	321	377
	Percent	1.9	2.2	72.0	24.0			
	SD	0.8	0.8	2.5	2.4			
	Mean length	373	601	803	885			
	SD	17.3	23.2	4.0	7.3			

[a] Includes fish that were not assigned an age. Not all fish examined for marks were scale sampled (i.e., carcass decayed, part of body missing, etc.).

recovery events (χ^2 = 43.4, df = 1, P < 0.001). In addition, sex determination was less accurate during the marking event (see Discussion). Therefore, only the spawning ground samples were used to estimate sex composition (by age) in the escapement.

The majority (48%) of the estimated escapement of medium and large chinook salmon in 2001 was age-1.3 fish (1996 brood year, Table 5). The remainder of the escapement was composed of 14% age-1.2, and 38% age-1.4 fish. Most (62%) of the fish were males (Table 5).

Table 5.–Estimated abundance of medium and large chinook salmon in the 2001 Chilkat River escapement, by age and sex.

	Brood year and age class			
	1997	1996	1995	
	1.2	1.3	1.4	**Total**
Male	755	1,651	858	3,264
SE	209	252	277	429
Female		878	1,130	2,008
SE		142	359	386
All fish	755	2,529	1,988	5,272
SE	209	376	617	752

HARVEST

2001 Haines Marine Sport Fishery Harvest

An estimated total 5,299 (SE = 815) angler-hours of effort were expended in the Haines marine boat fishery between May 7 and June 24, 2001 to catch 199 (SE = 32) and harvest 185 (SE = 26) large chinook salmon (Table 6). This estimate is based on a sample of 186 boat-parties who fished 1,765 angler-hours (1,689 salmon-hours), and harvested 94 large (≥28 inches total length) chinook salmon (Table 6). An estimated 126 (SE = 20) of the chinook salmon harvested in this fishery were wild mature fish assumed to be returning to the Chilkat River. About 96% (5,107 salmon-hours, SE = 804) of angler effort targeted chinook salmon, and the remainder was directed toward other species, primarily Pacific halibut. Anglers caught an estimated 361 (SE = 86) small (<28 inches total length) chinook salmon of which 84 (SE = 35) were kept. Eighty-nine percent (89%) of the estimated salmon effort and 91% of the estimated harvest of chinook salmon occurred between May 21 and June 17 (Table 6).

Angling pressure for chinook salmon was relatively light during the first and last week, so our coverage of the fishery for mature chinook salmon was essentially complete.

Estimates by site are presented in Appendices A1 through A3. Charter boat anglers accounted for about 10% of the salmon effort (486 salmon-hours, SE = 121), and 27% of the harvest (50, SE = 16) of large chinook salmon in this fishery.

Estimates by site are presented in Appendices A1 through A3. Charter boat anglers accounted for about 10% of the salmon effort (486 salmon-hours, SE = 121), and 27% of the harvest (50, SE = 16) of large chinook salmon in this fishery.

Anglers returning to Letnikof Dock (the high-use site) were responsible for 63% of the estimated salmon effort (3,198 salmon-hours, SE = 387) and 62% of the estimated harvest (115, SE = 15) of large chinook salmon (Appendix A1). Anglers returning to the Chilkat State Park boat launch accounted for an estimated 939 (SE = 602) salmon-hours of effort and harvested 21 (SE = 14) large chinook salmon (Appendix A2). Those returning to the Small Boat Harbor expended 970 (SE = 366) salmon-hours and harvested 49 (SE = 16) large chinook salmon (Appendices A3).

Age and Length of Harvest

We sampled a total of 92 chinook salmon for age and length in the angler harvest; 80 were assigned an age. The age composition of the harvest during May was not significantly different from that of the June harvest (χ^2 = 1.173, df = 1, P = 0.279), so samples were pooled over time. The age composition of fish landed at the Small Boat Harbor was obviously different from that of fish landed at the Chilkat Inlet harbors (Table 7) so these samples were analyzed separately.

Table 6.–Sampling statistics and estimated effort, catch, and harvest of chinook salmon in the Haines marine boat sport fishery, by biweek, May 7–June 24, 2001.

		May 21–June 03				
	May 07–20	Non-derby	Derby	June 04–17	June 18–24	Total
Boats counted	11	26	47	94	8	186
Angler-hours sampled	89	152	676	803	45	1,765
Salmon-hours sampled	89	152	603	801	44	1,689
Chinook sampled	2	9	49	30	4	94
Sampled for ad-clips	2	9	49	29	4	93
Ad-clips	0	0	4	0	1	5
Angler-hours						
Estimate	407	502	1,782	2,451	157	5,299
Variance	97,542	84,139	90,939	387,071	4,156	663,847
Salmon-hours						
Estimate	407	502	1,600	2,445	153	5,107
Variance	97,542	84,139	74,101	387,025	4,229	647,036
Large chinook catch						
Estimate	2	30	56	97	14	199
Variance	0	204	4	655	168	1,031
Large chinook kept						
Estimate	2	30	56	83	14	185
Variance	0	204	4	319	168	695
Wild mature chinook kept (excluding hatchery and immature fish)						
Estimate	2	22	48	54	0	126
Variance	0	176	4	235	0	415
Small chinook catch						
Estimate	0	24	40	262	35	361
Variance	0	279	80	5,969	1,050	7,378
Small chinook kept						
Estimate	0	0	0	70	14	84
Variance	0	0	0	1,092	168	1,260

We sampled 72 chinook salmon for age and length at the Chilkat Inlet harbors (Letnikof Dock and Chilkat State Park boat launch), and 62 of these were assigned an age (Table 7). Most (58.3%, SE = 5.9%) of the fish harvested were male. The predominant age class was age-1.3 (74.2%, SE = 5.6%).

We sampled 20 chinook salmon for age and length at the Small Boat Harbor and 18 of these were assigned an age (Table 7). Eleven (11) of those sampled were <28 inches in total length and were caught in the Taiya Inlet terminal harvest area for hatchery chinook salmon.

Twenty eight (28) chinook salmon were also sampled for age and length from the Chilkat Inlet subsistence fishery between June 16 and July 14, 2001. Subsistence fishers reported harvesting 60 chinook salmon in this fishery in 2001. These fish were predominately male and age-1.3 (Appendix A4).

Contribution of Coded Wire Tagged Stocks

Chinook salmon incubated and reared at the Jerry Myers hatchery facility that were released into Pullen Creek (1996 brood) were recovered in the 2001 Haines marine creel survey (Table 8). Five of the 82 large chinook salmon sampled between May 7 and June 24 were missing adipose fins. Of the estimated 185 large chinook salmon harvested in the Haines marine boat sport fishery, 7 (SE = 3) were from the Jerry Myers hatchery (Table 8).

Table 7.–Estimated age composition and mean length-at-age (measured in mm from snout to fork of tail) of harvested chinook salmon in the Haines marine boat sport fishery, by location, May 7–June 24, 2001.

		Brood year and age class				Total aged	Total sampled[a]
		1997 1.2	1996 0.4	1996 1.3	1995 1.4		
CHILKAT INLET HARBORS							
Males	Sample size	2	1	30	5	38	42
	Percent	5.3	2.6	78.9	13.2		58.3
	SE	3.7	2.6	6.7	5.6		5.9
	Mean length	723	1,025	878	1,127		
	SE	17.7		13.3	31.4		
Females	Sample size	0	0	16	8	24	30
	Percent			66.7	33.3		41.7
	SE			9.8	9.8		5.9
	Mean length			847	1,008		
	SE			21.1	16.8		
Combined	Sample size	2	1	46	13	62	72
	Percent	3.2	1.6	74.2	21.0		
	SE	2.3	1.6	5.6	5.2		
	Mean length	723	1,025	867	1,054		
	SE	17.7		11.3	22.5		
SMALL BOAT HARBOR							
Males	Sample size	1	0	1	2	4	5
	Percent	25.0		25.0	50.0		25.0
	SE	25.0		25.0	28.9		9.9
	Mean length	605		735	1,015		
	SE				106.1		
Females	Sample size	8	0	6	0	14	15
	Percent	57.1		42.9			75.0
	SE	13.7		13.7			9.9
	Mean length	591		758			
	SE	9.8		35.0			
Combined	Sample size	9	0	7	2	18	20
	Percent	50.0		38.9	11.1		
	SE	12.1		11.8	7.6		
	Mean length	593		755	1,015		
	SE	8.7		29.4	106.1		

[a] Includes fish that were not assigned an age.

Table 8.–Contribution estimate of coded wire tagged chinook salmon to the Haines marine boat sport fishery, with statistics used for computing estimates, 2001.

					Harvest		Sample	Adclip	Head	Detect	Decode	Tags	Contribution	
Hatchery	**Release site**	**Tag code**	**Brood year**	**Biweek**	N	SE[N]	***n***	***a***	***a′***	***t***	***t′***	***m***	***r***	SE
Jerry Myers	Pullen Creek	04-47-27	1996	May 07–June 24	185	26	82	5	5	3	3	3	7	3
Total													**7**	**3**

FRY TAGGING AND MEAN LENGTH

We captured 30,121 chinook salmon fry during fall 2000, and 23,154 during fall 2001 (Table 9). Overall catch rates were higher in 2000 than in 2001 (Table 8). Catch rates were lowest in the Tahini River both years, and highest in the Kelsall River in 2000 and the Chilkat River in 2001. Of those captured, 30,104 in 2000 and 23,123 in 2001 were released with a valid CWT and adipose finclip (Table 10). In addition, we released 4,506 smolt during spring 2001 (Ericksen 2002), and 4,709 in 2002 (Ericksen *In prep*) with valid CWTs and an adipose finclip (Table 10).

Six hundred thirty-nine (639) chinook salmon fry in 2000, and 430 in 2001 were sampled for length during fall (Table 11). The mean length of fry was similar between 2000 (70 mm, SE = 0.3 mm) and 2001 (68 mm, SE = 0.3 mm). In addition, 355 smolt in 2001 and 481 in 2002 were sampled for length during spring (Table 11). Smolt sampled during spring 2001 (79 mm, SE = 0.4 mm) were significantly larger (K-S test, $d_{max} = 0.543$, $P < 0.001$) than those sampled in 2002 (71 mm, SE = 0.3 mm).

Table 9.–Fall chinook salmon fry trapping statistics, 2000–2001.

Year	Trapping area	Dates	Days fished	Trap sets	Fry caught	CPUE[a]
2000	Tahini River	09/19–09/27	8	886	5,314	6.0
2000	Kelsall River	10/03–10/20	14	1,179	17,655	15.0
2000	Chilkat/ Klehini	09/24–10/29	10	563	7,152	12.7
	2000 subtotal		32	2,628	30,121	11.5
2001	Tahini River	09/19–09/24	5	516	2,394	4.6
2001	Kelsall River	09/27–10/11	14	1,055	11,269	10.7
2001	Chilkat River	10/17–10/26	9	748	9,491	12.7
	2001 subtotal		28	2,319	23,154	10.0

[a] Catch per unit of effort expressed as the number of fry caught per trap set.

DATA FILES

Data collected during this study (Appendix A5) have been archived in ADF&G offices in Haines, Douglas, and Anchorage.

DISCUSSION

Several assumptions, as noted above, underlie our estimate of abundance. Considerable efforts were made to catch and mark fish in proportion to their abundance (assumption a) by sampling uniformly across the escapement. Also, sampling effort for tag recovery on the Kelsall and Tahini rivers (where >90% of spawning occurred in 1991 and 1992; Johnson et al. 1992, 1993) was fairly constant across the time when spawning fish die and are available for sampling. Previous research on the Chilkat River (Johnson et al. 1992, 1993) suggests that immigration timing is similar for Tahini and Kelsall River stocks. Tagging ratios of large chinook salmon found on the Tahini ($P = 0.052$) and Kelsall-Nataga ($P = 0.063$) rivers in 2001 were similar. Although carcass surveys can be sex-selective in some situations (Pahlke et al. 1996, McPherson et al. 1997), I could not detect a significant difference from the battery of tests applied in this study. The assumption of no recruitment during the experiment is reasonable, because tagging effort was relatively constant and continued until only about one fish per day was being caught. I could not test the assumption that marking does not affect catchability directly. However, recovery rates were not significantly different between large fish marked in the gillnet and those marked in the fish wheels, ($\chi^2 = 0.098$, df = 1, $P = 0.754$). This suggests fish marked at the fish wheels and gillnets had similar mortality rates. Because all fish had secondary marks that were not lost, assumption (d) was satisfied. Personnel sampling on the spawning tributaries carefully examined

Table 10.–Number of chinook salmon coded wire tagged by area and brood year, 2000–2002.

Brood year	Tag year	Tag code	Location	Last date	Stage	Tagged	24h morts	Marked	Shed tags	Valid CWTs
1999	2000	040365	Chilkat River	10/30/00	Fry	7,152	5	7,147	0	7,147
1999	2000	040366	Kelsall River	10/13/00	Fry	10,154	4	10,150	0	10,150
1999	2000	040166	Kelsall River	10/21/00	Fry	7,501	4	7,497	0	7,497
1999	2000	040364	Tahini River	09/28/00	Fry	5,314	4	5,310	0	5,310
1999	2001[a]	040167	Chilkat River	05/29/01	Smolt	4,509	3	4,506	0	4,506
1999 brood year total						34,630	20	34,610	0	34,610
2000	2001	040299	Chilkat River	10/27/01	Fry	9,491	21	9,470	0	9,470
2000	2001	040297	Kelsall River	10/12/01	Fry	10,919	6	10,913	0	10,913
2000	2001	040296[b]	Tahini River	10/12/01	Fry	2,744	4	2,740	0	2,740
2000	2002[c]	040540	Chilkat River	05/29/02	Smolt	4,720	6	4,714	5	4,709
2000 brood year total						27,874	31	27,837	5	27,832

[a] Data taken from Ericksen 2002.

[b] This total includes 350 chinook salmon captured at the Kelsall River that were tagged with this tag code on 10/11.

[c] Data taken from Ericksen *In prep*.

Table 11.–Mean length of juvenile chinook salmon by brood year, trapping location, and time, 2000–2002.

Brood year	Sample year	Trapping location	Sample dates	Fork length (mm)			
				n	Range	Mean	SE
1999	2000	Tahini River	09/22–09/28	114	57–86	70	0.5
1999	2000	Kelsall River	10/05–10/21	372	53–101	71	0.4
1999	2000	Chilkat/Klehini	09/26–10/30	153	54–86	68	0.6
1999		Fall subtotal		639	53–101	70	0.3
1999	2001	Chilkat River	04/19–05/29	355	58–101	79	0.4
2000	2001	Tahini River	09/21–09/25	41	61–85	74	0.8
2000	2001	Kelsall River	09/30–10/12	188	56–89	70	0.5
2000	2001	Chilkat River	10/19–10/27	201	51–81	66	0.4
2000		Fall subtotal		430	51–89	68	0.3
2000	2002	Chilkat River	04/11–05/19	481	53–95	71	0.3

each fish for marks; therefore failure of assumption (e) is unlikely.

I failed to reject the hypothesis that fish sampled on the spawning grounds were marked at the same rate. This is consistent with the results of a meta-analysis of past data (Ericksen 2001).

The significant difference in the age compositions between the first and second sampling events is disturbing. This implies that one of the events was size (or age) selective. However, by stratifying the estimate by age, our estimate should be unbiased.

The significant differences in the age compositions on the spawning tributaries probably arise from a combination of factors. First, the higher proportion of age-1.4 fish in Big Boulder was likely a result of enhancement efforts in 1995.

Table 12.–Estimated annual age compositions and brood year returns of large (≥age-1.3) **chinook salmon immigrating into the Chilkat River, 1991–2001.** Age compositions were estimated from age samples of large chinook salmon from the drift gillnet prior to the 1997 return.

Return year		Age class 1.3	1.4	1.5	Total
1991	Abundance[a]	2,552	3,169	176	5,897
	SE	458	570	22	1,005
1992	Abundance[b]	1,689	3,595		5,284
	SE	309	662		949
1993	Abundance[c]	2,217	2,180	75	4,472
	SE	432	425	10	851
1994	Abundance[d]	2,405	4,276	115	6,795
	SE	382	681	15	1,057
1995	Abundance[e]	450	3,077	263	3,790
	SE	93	664	52	805
1996	Abundance[f]	4,077	788	54	4,920
	SE	632	120	6	751
1997	Abundance[g]	1,943	6,157	0	8,100
	SE	354	930		1,193
1998	Abundance[h]	1,016	2,440	219	3,675
	SE	169	381	48	565
1999	Abundance[i]	534	1,656	80	2,271
	SE	109	302	27	408
2000	Abundance[j]	1,350	653	32	2,035
	SE	227	118	14	334
2001	Abundance	2,529	1,988	0	4,517
	SE	376	617		722
Avg.	Percent	40.1	57.9	2.0	
	Abundance	1,888	2,725	92	4,705

BROOD YEAR RETURNS

Brood year	Age class 1.3	1.4	1.5	Total	SE
1986	2,552	3,595	75	6,222	805
1987	1,689	2,180	115	3,983	525
1988	2,217	4,276	263	6,755	809
1989	2,405	3,077	54	5,536	766
1990	450	788	0	1,239	152
1991	4,077	6,157	219	10,453	1,126
1992	1,943	2,440	80	4,463	521
1993	1,016	1,656	32	2,705	347
1994	534	653	0	1,188	160
1995	1,350	1,988		3,338	657
1996	2,529			2,529	376
Avg.	1,888	2,681	93	4,662	

[a] Data taken from Johnson et al. (1992).
[b] Data taken from Johnson et al. (1993).
[c] Data taken from Johnson (1994).
[d] Data taken from Ericksen (1995).
[e] Data taken from Ericksen (1996).
[f] Data taken from Ericksen (1997).
[g] Data taken from Ericksen (1998).
[h] Data taken from Ericksen (1999).
[i] Data taken from Ericksen (2000).
[j] Data taken from Ericksen (2001a).

This was the last year the instream incubation facility was used. Second, the Chilkat River drainage sustained disastrous flooding during fall 1998. This flooding caused some major channel shifts in the Kelsall River. This may have caused high mortality of juvenile chinook (1997 brood year) rearing in the Kelsall drainage at the time.

The immigration timing of chinook salmon through the lower Chilkat River was nearly identical to the average observed in past years. The mean date of migratory timing (Mundy 1984) was July 4. In contrast, the mean date for 1991–2000 was July 3 (Figure 4).

The 2001 immigration of large chinook salmon 4,517 (SE = 722) was slightly below the 1991–2000 average (Table 12). However, this is much better than observed during the past three years. The escapement was composed mainly of age-1.3 fish from the 1996 brood year (Table 12).

Sex was estimated with uncertainty early in the season. Eleven (11) out of 46 tagged fish that were recaptured on the spawning grounds were sexed incorrectly during the marking event, as judged by sex determination on the spawning ground (where sexual dimorphism is more evident). All but one of these fish were sexed as

Table 13.–Estimated angler effort, and large (≥28 in.) chinook salmon catch and harvest in the Haines marine boat sport fishery for similar sample periods, 1984–2001.

		Effort				Large (28") chinook salmon				
Year	Survey dates	Angler-hours	SE	Salmon-hours	SE	Catch	SE	Harvest	SE	CPUE[a]
1984[b]	5/06–6/30	10,253	[c]	9,855	[c]	1,072	[c]	1,072	[c]	0.109
1985[d]	4/15–7/15	21,598	[c]	20,582	[c]	1,705	[c]	1,696	[c]	0.083
1986[e]	4/14–7/13	33,857	[c]	32,533	[c]	1,659	[c]	1,638	[c]	0.051
1987[f]	4/20–7/12	26,621	2,557	22,848	2,191	1,094	189	1,094	189	0.048
1988[g]	4/11–7/10	36,222	3,553	32,723	3,476	505	103	481	101	0.015
1989[h]	4/24–6/25	10,526	999	9,363	922	237	42	235	42	0.025
1990[i]	4/23–6/21	[i]	[i]	11,972	1,169	248	60	241	57	0.021
1993[j]	4/26–7/18	11,919	1,559	9,069	1,479	349	63	314	55	0.038
1994[k]	5/09–7/03	9,726	723	7,682	597	269	41	220	32	0.035
1995[l]	5/08–7/02	9,457	501	8,606	483	255	42	228	41	0.030
1996[m]	5/06–6/30	10,082	880	9,596	866	367	43	354	41	0.038
1997[n]	5/12–6/29	9,432	861	8,758	697	381	46	381	46	0.044
1998[o]	5/11–6/28	8,200	811	7,546	747	222	60	215	56	0.029
1999[p]	5/10–6/27	6,206	736	6,097	734	184	24	184	24	0.030
2000[q]	5/08–6/25	4,428	607	4,043	532	103	34	49	12	0.025
2001	5/07–6/24	5,299	815	5,107	804	199	26	185	26	0.039
1984–86 average		21,903		20,990		1,479		1,469		0.081
1987–90 average		24,456		19,227		521		513		0.027
1993–01 average		8,305		7,389		259		237		0.034

[a] Catch of large chinook salmon per salmon hour of effort.

[b] Neimark (1985).

[c] Estimates of variance were not provided until 1987.

[d] Mecum and Suchanek (1986).

[e] Mecum and Suchanek (1987).

[f] Bingham et al. (1988).

[g] Suchanek and Bingham (1989).

[h] Suchanek and Bingham (1990).

[i] Suchanek and Bingham (1991); no estimate of total angler effort and harvest was provided.

[j] Ericksen (1994).

[k] Ericksen (1995).

[l] Ericksen (1996).

[m] Ericksen (1997).

[n] Ericksen (1998).

[o] Ericksen (1999).

[p] Ericksen (2000).

[q] Ericksen (2001a).

female when tagged and as males on the spawning grounds during 2001.

Sport fishing harvest patterns observed during 2001 were similar to those observed in past years. During 2001, 62% of the estimated harvest of chinook salmon was landed at the Letnikof Dock. Since 1996, the harvest from this dock has averaged 63%.

The 2001 estimated harvest of large chinook salmon was similar to the average since 1993 but much lower than observed during the mid 1980s (Table 13, Figure 6). Also, sport fishing effort increased from 2000 but remained lower than past years. Catch of large chinook salmon per salmon hour of effort (CPUE) in 2001 was similar to the mean of those observed since the fishery reopened in 1993 (Table 13, Figure 6).

Trapping chinook salmon fry in the fall increased the number of CWT'd fish released for a given brood year relative to tagging smolt in the spring.

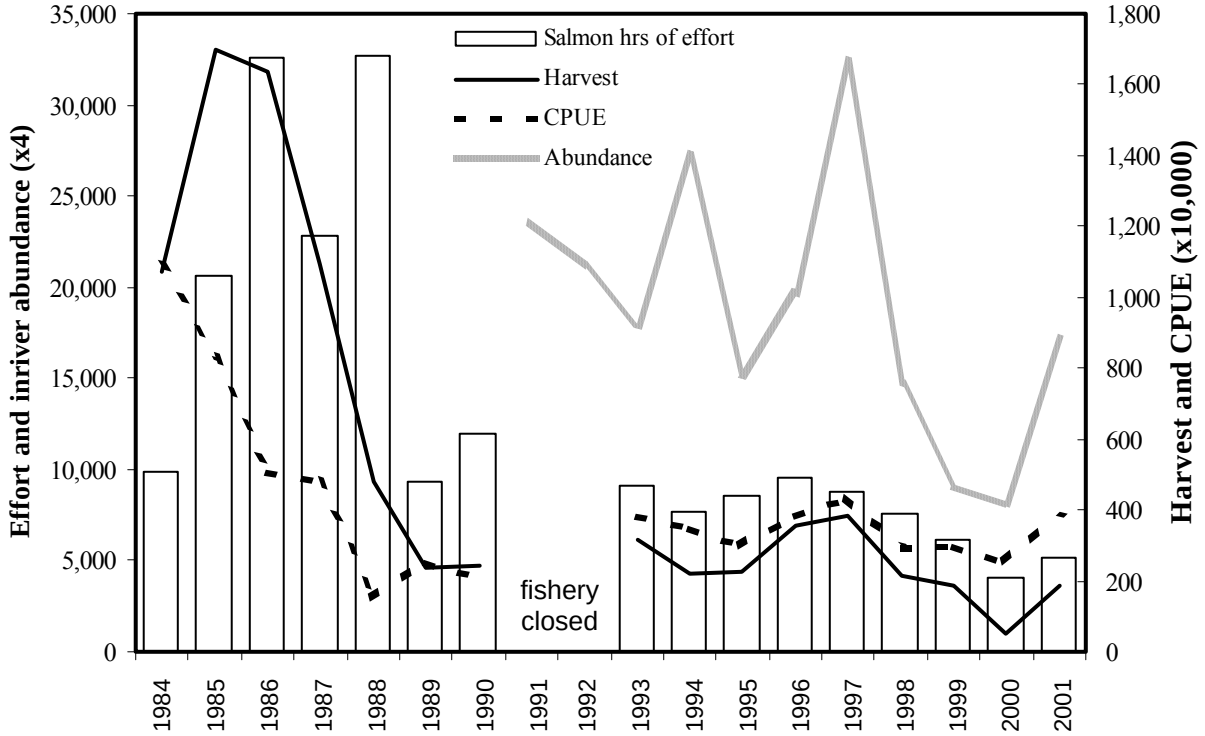


Figure 6.–Estimated angler effort for, and harvest and catch of large chinook salmon per salmon hour of effort (CPUE) in the Haines spring marine boat sport fishery, 1984–2001 and estimated inriver abundance of large chinook salmon in the Chilkat River, 1991–2001. Data taken from Tables 9 and 10.

The benefits of tagging in the fall are somewhat offset by overwinter mortality of the fry. We will be able to assess the cost effectiveness of fall trapping better after adult fish have returned to estimate overwinter survival.

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LITERATURE CITED

Bernard, D. R., and J. E. Clark. 1996. Estimating salmon harvest with coded-wire tags. Canadian Journal of Fisheries and Aquatic Sciences 53:2323-2332.

Bethers, M. 1986. Annual sport fish management report for northern Southeast Alaska. Unpublished report. Alaska Department of Fish and Game, Sport Fish Division, Juneau, AK.

Bingham, A. E., P. M. Suchanek, S. Sonnichsen, and R. D. Mecum. 1988. Harvest estimates for selected sport fisheries in southeast Alaska in 1987. Alaska Department of Fish and Game, Fishery Data Series No. 72, Juneau.

Bugliosi, E. F. 1988. Hydrologic reconnaissance of the Chilkat River Basin, Southeast Alaska. U.S. Geological Survey Water Resources Investigation Report 88-4021, Anchorage, Alaska.

Cochran, W. G. 1977. Sampling techniques, third edition. John Wiley and Sons, New York.

Ericksen, R. P. 1994. Effort, catch, and harvest of chinook salmon in the spring marine boat sport fishery near Haines, Alaska, 1993. Alaska Department of Fish and Game, Fishery Data Series No. 94-30, Anchorage.

Ericksen, R. P. 1995. Sport fishing effort, catch, and harvest and inriver abundance of Chilkat River chinook salmon near Haines in 1994. Alaska Department of Fish and Game, Fishery Data Series No. 95-42, Anchorage.

Ericksen, R. P. 1996. Sport fishing effort, catch, and harvest, fishery contributions, and inriver abundance of Chilkat River chinook salmon in 1995. Alaska Department of Fish and Game, Fishery Data Series No. 96-48, Anchorage.

Ericksen, R. P. 1997. Sport fishing effort, catch, and harvest, and inriver abundance of Chilkat River chinook salmon in 1996. Alaska Department of Fish and Game, Fishery Data Series No. 97-27, Anchorage.

Ericksen, R. P. 1998. Sport fishing effort, catch, and harvest, and inriver abundance of Chilkat River chinook salmon in 1997. Alaska Department of Fish and Game, Fishery Data Series No. 98-31, Anchorage.

Ericksen, R. P. 1999. Sport fishing effort, catch, and harvest, fishery contributions, and inriver abundance of Chilkat River chinook salmon near Haines, in 1998. Alaska Department of Fish and Game, Fishery Data Series No. 99-19, Anchorage.

Ericksen, R. P. 2000. Sport fishing effort, catch, and harvest, and inriver abundance of Chilkat River chinook salmon in 1999. Alaska Department of Fish and Game, Fishery Data Series No. 00-28, Anchorage.

Ericksen, R. P. 2001a. Sport fishing effort, catch, and harvest, and inriver abundance of Chilkat River chinook salmon in 2000. Alaska Department of Fish and Game, Fishery Data Series No. 01-12, Anchorage.

Ericksen, R. P. 2001b. Smolt production and harvest of coho salmon from the Chilkat River, 1999-2000. Alaska Department of Fish and Game, Fishery Data Series No. 01-17, Anchorage.

Ericksen, R. P. 2002. Smolt production and harvest of coho salmon from the Chilkat River, 2000-2001. Alaska Department of Fish and Game, Fishery Data Series No. 02-18, Anchorage.

Ericksen, R. P. *In prep*. Smolt production and harvest of coho salmon from the Chilkat River, 2001-2002. Alaska Department of Fish and Game, Fishery Data Series No. 03-xx, Anchorage.

Johnson, R. E. 1994. Chilkat River chinook salmon studies, 1993. Alaska Department of Fish and Game, Fishery Data Series No. 94-46, Anchorage.

Johnson, R. E., R. P. Marshall, and S. T. Elliott. 1992. Chilkat River chinook salmon studies, 1991. Alaska Department of Fish and Game, Fishery Data Series No. 92-49, Anchorage.

Johnson, R. E., R. P. Marshall, and S. T. Elliott. 1993. Chilkat River chinook salmon studies, 1992. Alaska Department of Fish and Game, Fishery Data Series No. 93-50, Anchorage.

Jones and Stokes Associates, Inc. 1991. Southeast Alaska sport fishing economic study. Final Research Report. December 1991. (JSA 88-028) Sacramento, CA. Prepared for Alaska Department of Fish and Game, Sport Fish Division, Research and Technical Services Section, Anchorage, AK.

Kissner, P. D., Jr., 1982. A study of chinook salmon in southeast Alaska. Alaska Department of Fish and Game. Annual Report 1981–1982, Project F-9-14, 24 (AFS-41).

McPherson, S. A., D. R. Bernard, M. S. Kelley, P. A. Milligan, and P. Timpany. 1997. Spawning abundance of chinook salmon in the Taku River in 1996. Alaska Department of Fish and Game, Fishery Data Series No. 97-14, Anchorage.

Mecum, R. D., and P. M. Suchanek. 1986. Southeast Alaska sport harvest estimates. Alaska Department of Fish and Game, Federal Aid in Fish Restoration, Annual Performance Report 1985-1986, Project F-10-1, 27 (S-1-1), Juneau.

Mecum, R. D., and P. M. Suchanek. 1987. Harvest estimates for selected sport fisheries in southeast Alaska in 1986. Alaska Department of Fish and Game, Fishery Data Series No. 21, Juneau.

Mundy, P. R. 1984. Migratory timing of salmon in Alaska with an annotated bibliography on migratory

behavior of relevance to fisheries research. Alaska Department of Fish and Game, Informational Leaflet No. 234, Juneau.

Neimark, L. M. 1985. Harvest estimates for selected fisheries throughout southeast Alaska. Alaska Department of Fish and Game, Federal Aid in Fish Restoration, Annual Performance Report 1984-1985, Project F-9-17, 26 (AFS-41-12B), Juneau.

Olsen, M. A. 1992. Abundance, age, sex, and size of chinook salmon catches and escapements in Southeast Alaska in 1987. Alaska Department of Fish and Game Technical Data Report No. 92-07, Juneau.

Pahlke, K. A. 1990. Migratory patterns and fishery contributions of Chilkat River chinook salmon. Alaska Department of Fish and Game, Fishery Data Series No. 90-50. Juneau.

Pahlke, K. A. 1991. Migratory patterns and fishery contributions of Chilkat River chinook salmon, 1990. Alaska Department of Fish and Game, Fishery Data Series No. 91-55. Juneau.

Pahlke, K. A. 1992. Escapements of chinook salmon in Southeast Alaska and transboundary rivers in 1991. Alaska Department of Fish and Game, Fishery Data Series No. 92-32. Juneau.

Pahlke, K. A. 1997. Escapements of chinook salmon in southeast Alaska and transboundary rivers in 1996. Alaska Department of Fish and Game, Division of Sport Fish, Fisheries Data Series No. 97-33.

Pahlke, K. A., S. A. McPherson, and R. P. Marshall. 1996. Chinook salmon research on the Unuk River, 1994. Alaska Department of Fish and Game, Fishery Data Series No 96-14. Anchorage.

Seber, G. A. F. 1982. The estimation of animal abundance and related parameters, second edition. Macmillan, New York.

Suchanek, P. M., and A. E. Bingham. 1989. Harvest estimates for selected sport fisheries in southeast Alaska in 1988. Alaska Department of Fish and Game, Fishery Data Series No. 114, Juneau.

Suchanek, P. M., and A. E. Bingham. 1990. Harvest estimates for selected marine boat sport fisheries in southeast Alaska in 1989. Alaska Department of Fish and Game, Fishery Data Series No. 90-51, Anchorage.

Suchanek, P. M., and A. E. Bingham. 1991. Harvest estimates for selected marine boat sport fisheries in southeast Alaska during 1990. Alaska Department of Fish and Game, Fishery Data Series No. 91-48, Anchorage.

APPENDIX A

Appendix A1.–Sampling statistics and estimated effort, catch, and harvest of chinook salmon at the Letnikof Dock by week, May 7–June 24, 2001.

	May 07 May 13	May 14 May 20	May 21 - June 03 Non-derby	May 21 - June 03 Derby	June 04 June 10	June 11 June 17	June 18 June 24	Total
Boats counted	0	7	22	41	55	23	4	152
Angler-hs. sampled	0	41	135	638	492	134	33	1,473
Salmon-hs. sampled	0	41	135	565	492	132	33	1,398
Chinook sampled	0	2	8	48	9	4	0	71
Sampled for ad-clips	0	2	8	48	9	4	0	71
Ad-clips	0	0	0	4	0	0	0	4
Angler-hours								
Estimate	0	71	425	1,594	876	344	76	3,386
Variance	0	774	83,178	76,354	2,456	3,546	659	166,967
Salmon-hours								
Estimate	0	71	425	1,412	876	338	76	3,198
Variance	0	774	83,178	59,516	2,456	3,500	659	150,083
Large chinook catch								
Estimate	0	2	25	54	21	13	0	115
Variance	0	0	188	4	13	12	0	217
Large chinook kept								
Estimate	0	2	25	54	21	13	0	115
Variance	0	0	188	4	13	12	0	217
Wild mature chinook kept (excluding hatchery and immature fish)								
Estimate	0	2	22	46	20	13	0	103
Variance	0	0	176	4	13	12	0	205
Small chinook catch								
Estimate	0	0	6	30	26	5	0	67
Variance	0	0	27	0	35	12	0	74
Small chinook kept								
Estimate	0	0	0	0	0	0	0	0
Variance	0	0	0	0	0	0	0	0

Appendix A2.–Sampling statistics and estimated effort, catch, and harvest of chinook salmon at the Chilkat State Park boat launch by biweek, May 13–June 24, 2001.

		May 21 - June 03				
	May 13 May 20	Non-derby	Derby	June 04 June 17	June 18 June 24	Total
Boats counted	0	1	2	10	2	15
Angler-hs. sampled	0	3	11	123	3	140
Salmon-hs. sampled	0	3	11	123	2	139
Chinook sampled	0	0	0	3	0	3
Sampled for ad-clips	0	0	0	3	0	3
Ad-clips	0	0	0	0	0	0
Angler-hours						
Estimate	0	14	53	858	18	943
Variance	0	142	5	362,513	95	362,755
Salmon-hours						
Estimate	0	14	53	858	14	939
Variance	0	142	5	362,513	168	362,828
Large chinook catch						
Estimate	0	0	0	35	0	35
Variance	0	0	0	546	0	546
Large chinook kept						
Estimate	0	0	0	21	0	21
Variance	0	0	0	210	0	210
Wild mature chinook kept (excluding hatchery and immature fish)						
Estimate	0	0	0	21	0	21
Variance	0	0	0	210	0	210
Small chinook catch						
Estimate	0	0	0	14	0	14
Variance	0	0	0	168	0	168
Small chinook kept						
Estimate	0	0	0	0	0	0
Variance	0	0	0	0	0	0

Appendix A3.–Sampling statistics and estimated effort, catch, and harvest of chinook salmon at the Small Boat Harbor by biweek, May 7–June 24, 2001.

		May 21 - June 03				
	May 07 May 20	Non-derby	Derby	June 04 June 17	June 18 June 24	Total
Boats counted	4	3	4	6	2	19
Angler-hs. sampled	48	14	27	54	9	152
Salmon-hs. sampled	48	14	27	54	9	152
Chinook sampled	0	1	1	14	4	20
Sampled for ad-clips	0	1	1	13	4	19
Ad-clips	0	0	0	0	1	1
Angler-hours						
Estimate	336	63	135	373	63	970
Variance	96,768	819	14,580	18,556	3,402	134,125
Salmon-hours						
Estimate	336	63	135	373	63	970
Variance	96,768	819	14,580	18,556	3,402	134,125
Large chinook catch						
Estimate	0	5	2	28	14	49
Variance	0	16	0	84	168	268
Large chinook kept						
Estimate	0	5	2	28	14	49
Variance	0	16	0	84	168	268
Wild mature chinook kept (excluding hatchery and immature fish)						
Estimate	0	0	2	0	0	2
Variance	0	0	0	0	0	0
Small chinook catch						
Estimate	0	18	10	217	35	280
Variance	0	252	80	5,754	1050	7,136
Small chinook kept						
Estimate	0	0	0	70	14	84
Variance	0	0	0	1,092	168	1,260

Appendix A4.–Estimated age composition and mean length-at-age (measured in mm from snout to fork of tail) of chinook salmon incidentally harvested in the Chilkat Inlet subsistence gillnet fishery, June 16–July 14, 2001.

		Brood year and age class				
		1997	1996	1995	**Total**	**Total**
		1.2	1.3	1.4	**aged**	**sampled**[a]
Males	Sample size	7	9	1	17	22
	Percent	41.2	52.9	5.9		78.6
	SE	12.3	12.5	5.9		7.9
	Mean length	577	806	1,030		
	SE	30.3	44.8			
Females	Sample size	0	2	1	3	6
	Percent		66.7	33.3		21.4
	SE		33.3	33.3		7.9
	Mean length		900	833		
	SE		0.0			
Combined	Sample size	7	11	2	20	28
	Percent	35.0	55.0	10.0		
	SE	10.9	11.4	6.9		
	Mean length	577	823	932		
	SE	30.3	37.9	139.3		

[a] Includes fish that were not assigned an age.

Appendix A5.–Computer data files used in the analysis of this report.

FILE NAME	DESCRIPTION
F2008100M012001.DTA	Mark-sense ASCII file containing angler interview data from the Haines marine sport fishery in 2001.
HAINE1.PRG	Dbase program to generate SAS data file from mark-sense file.
HAINESCT.PRN	Count file (text) used in HAMC01.SAS to expand for missing interview data.
HAMC01.SAS	SAS program to estimate effort and harvest in the Haines marine sport fishery using HAINESCT.PRN and output from HAINE1.PRG.
01SPORTAWL.XLS	Excel workbook containing all age-length data from the Haines sport fishery during 2001.
01POPEST.XLS	Excel workbook used to estimate 2001 abundance of Chilkat River chinook.
01SPAWN.XLS	Excel workbook containing raw data from chinook sampled on the Chilkat River spawning tributaries during 2001.
01TAGS.XLS	Excel workbook containing raw data from chinook captured in the lower Chilkat River during 2001.
01AGESEX.XLS	Excel workbook used to estimate the number of large chinook salmon in the 2001 Chilkat River escapement by age and sex.
00FALLLENGTHS.XLS	Excel workbook containing length data from chinook fry sampled in the Chilkat River drainage during 2000.
00FALLTRAPS.XLS	Excel workbook containing effort and chinook fry catch data during the fall of 2000.
01FALLLENGTHS.XLS	Excel workbook containing length data from chinook fry sampled in the Chilkat River drainage during 2001.
01FALLTRAPS.XLS	Excel workbook containing effort and chinook fry catch data during the fall of 2001.